

Charge response and energy calibration of ProtoDUNE-SP

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ProtoDUNE-SP at the CERN Neutrino Platform is a test bed liquid argon time projection chamber (LArTPC) for the far-detector in the Deep Underground Neutrino Experiment (DUNE). Space charge effects, attenuation due to electronegative impurities, diffusion, and electronics gain variations cause nonuniformities in charge deposition per unit length (dQ/dx) within a LArTPC. Corrections for space charge effects with measured electric-field maps and attenuation with purity-monitor data were applied. A sample of cosmic-ray muons crossing the cathode is used to calibrate the detector response to get a uniform dQ/dx over space and time. Using cosmic-ray stopping muons, which have a well-known energy loss per unit length (dE/dx), the absolute energy scale was determined. These calibration factors were uploaded to a database for use in further physics analysis.

Summary

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